AUCTORES
Globalize your

Journal of Biotechnology and Bioprocessing
Kanwal Iqba, Anam Iqbal

Open Access

Research

Sustainable, Proficient Fodder Influenced By Bio Diversity in Mineral Composition of Shrub Leaves of Quetta District

Ghazala Shaeen[a], Mudassir Asrar Zaidi[a], Afroz Rais[b], Ikramullah Khan[c], Kanwal Iqbal[b]*, and Anam Iqbal[a]*

[a] Department of Chemistry, University of Baluchistan Quetta 87300, Pakistan.

[b] Department of Chemistry, Sardar Bahadur Khan Women's, University Quetta 87300Pakistan.

[c] Department of Weed Science, the University of Agriculture, Peshawar, Pakistan

***Corresponding Author: Anam Iqbal**, Department of Chemistry, University of Baluchistan Quetta 87300, Pakistan.

Kanwal Iqbal, Department of Chemistry, Sardar Bahadur Khan Women's, University Quetta 87300, Pakistan

Received date: July 18 2020; Accepted date: July 25, 2020; Published date: August 10, 2020

Citation: Ghazala Shaeena, Mudassir Asrar Zaidia, Afroz Raisb, Ikramullah Khanc, Kanwal Iqbalb, and Anam Iqbala, Sustainable, Proficient Fodder Influenced By Bio Diversity in Mineral Composition of Shrub Leaves of Quetta District; Biotechnology and Bioprocessing. 1(1);DOI: 10.315792766-2314/002

Abstract

The vegetation of Balochistan is of critical value to the quality of life for the local nomadic people. Many important dominant species used for animal grazing were selected to evaluate their value as fodder during 2016-2017. These plants including *Amylgdalus brahuica* Boiss, *Prunus eburnea Aitch*, *Caragana ambigua* Stocks, *Sophora mollis* Royle, *Perovskia abrotanoides* Karel, and *Berberis baluchistanica* Ahrendt, (as because *Sophora mollis* were not found in Zarghoon] were collected seasonally from Hazarganji, Karkhasa and Zarghoon area of Quetta district. These were analyzed for macro and micro elemental composition such as P, Ca, Na, K, S, Fe, Zn, Sr, Al and Mn by using atomic absorption, flame photometer and X-ray florescence spectrophotometer. The elemental concentrations were compared with standard feed table of Pakistan Agriculture Research Council. *P. eburnea* and *B. baluchistanica* showed good amount of nutrients in their foliage, these two plants were palatable and preferred by the small ruminants, while *A. brahuica* and *C. ambigua* showed medium amounts of minerals and fulfill the requirements of the animal as fodder. The animals did not prefer to eat *P. abrotanoides* may due to its strong smell while *S. mollis*had deposition of cutin and suberin on their leaves. It was observed that there was no significant difference ($P > 0.05$] in the concentration of different elements of the forage due to seasonal changes.

Keyword: nomadic, cuitn, subrin, ruminants, hazarganji, karkhasa, zarghoon

Introduction

Generally, plants are the most ancient friends of mankind and always played a major role in shaping the ecology of an environment, however, many efforts are continuously extending to establish the potential benefits of wild herbs and shrubs in the arid environment of Quetta. Shrubs have been considered as an important source for the nutrition of grazing animals in Pakistan, particularly in those areas like Quetta, with pronounced dry season and used as a supplement in the quantity and quality of pastures compounds [1-3]. According to FAO (1989) [4], plant species of Balochistan are deficient in total digestible nutrients and indigestible protein and dry matter concerning animal requirements. In Balochistan, previously the research has been only focused only on quantifying the crude protein of range forages [5], while only limited research was focused on quantifying the seasonal dynamics of the nutrients. However, it is important to know the micro-nutrient concentrations of new varieties because they forage are the primary source of nutrients for livestock in rangelands and the animals are mainly grazed on these rangelands [6], the reason behind this is that micro-nutrients present in the soil are transported to livestock through the forage on which they feed. Fodder shrubs provide forage for livestock throughout the world, when the values of grasses are below the minimum requirements for the maintenance of livestock. When plants accumulate a higher amount of nutrients for their physiological activities, growth and fruit production is expected to be high. The plant nutrient level can exceed that of soil. [7]. Low amount of soil nutrients may also be due to overgrazing, cutting of foliage, branches, and whole trees for fuel [8]. Water holding capacity, organic matter of soil, salinity, conductivity, total dissolved salts, pH, and soil compaction showed marked association with the distribution and abundance of vegetation [9]. Normal growth and development of the plants depend upon the continuous supply of nutrients, topographic, and edaphic conditions cutting, harvesting, and grazing can cause disturbance of soil nutritional characteristics and their availability [10]. The plants that are growing in the same soil vary in mineral concentration has also been reported [11, 12]. Feeding value of fodder shrubs also varies depending on species or cultivars, phonological stage, plant part, site, and environmental conditions. In the arid and semi-arid areas of the Quetta region fodder shrubs used as forage plants that can fulfill the gap of feed for livestock during the harsh environmental periods. In Quetta city, very little work has been done to establish the nutritional value of dominant plants used as forage. During the last decade of prolonged drought adversely affected the delicate ecosystem of the Quetta. Therefore, this research may be valuable to animal scientists and plant breeders in selecting the suitable variety of shrubs to evaluate their comparative value regarding all seasons and their effect on ruminant's nutritional patterns

Materials and Methods

The study was conducted to evaluate seasonal macro and micro mineral composition of dominant shrubs of three rangelands found in three different directions of the Quetta district for two years (2016-2017] in four different seasons. Following six shrubs were collected *Amylgdalus brassica* Boiss, *Prunus eburnea* Aitch, *Caragana ambigua* Stocks, *Sophora mollis* Royle, *Perovskia abrotanoides* Karel, and *Berberis baluchistanica* Ahrendt. While *Sophora mollis* was not found in the Zarghoon area. Samples were hand-plucked from three different sites of the same habitat. Vegetation analysis was done by using a complete random block design with three replicates. The elements Phosphorus [P], Calcium [Ca], Sodium [Na], Potassium [K], Sulphur [S], Iron [Fe], Zinc [Zn], Strontium [Sr], Manganese [Mn] and Aluminum [Al] were determined by atomic absorption, flame spectrophotometer AA-6105 [Schimdzu] and X-ray fluorescence spectrophotometer EDX-700 Hs [Schimdzu], according to "A Manual of Experiment for Plant Biology Methods [13]. Analysis of samples was carried out in duplicate. Results were calculated as a percentage on a dry weight basis. The standard deviation of elemental concentration was subject to analysis of variance (ANOVA).

Sites description

These rangelands lie within the arid and semi-arid climatic zones of Quetta (Balochistan) district. Due to severe drought in the past seven years, these ranges are degrading very rapidly causing loss of desirable species. First locality Hazargangi Chiltan National Park is located near Quetta at a distance of 20Km on Quetta Mastung road towards N W at 30° 07'N longitude, 66° 58 'E, with an altitude of 1700 meter. The region has Mediterranean climate, cold winter, and dry summer with dry semi-arid type of vegetation, the mean maximum temperature in summer is 36ºC and mean minimum temperature in winter is –10 ºC, while rainfall varies between 250-300 mm per year. Second habitat Zarghoon is located to the southern part of Quetta valley lies approximately between latitude 30º 39´ N and longitude 67º 15´ E. The locality has tremendous variation from hilltop to valley bottoms and gentle slopes with grasses scattered trees, dominated by these plants. Rain and snowfall is dominated in winter; the mean maximum temperature in summer is 25°C and means the minimum temperature in winter is –15°. The third habitat Karkhasa is near to the slopes of the Chiltan mountain range of Quetta. This lies at latitude 30º 09́ and longitude 66º 55́, the climate of the valley is arid with mild summer and severe winter. It is characterized by low precipitation, a high rate of evaporation, and a wide range of temperatures. The average mean maximum temperature rises to 35°C in summers and the mean minimum in winter goes down to –5°C for the month of January.

Results and Discussion

1. Phosphorus:

Phosphorus concentration in six dominated shrubs is presented in table 1-6. In shrub species studied the amount of phosphorus ranged between 1.70 - 0.06%DM. The highest amount of 1.70%DM was found in *P. eburnea*in summer season from the Hazargangi site. Medium amount 1.40%DM was observed in *C.ambigua* in the summer season from the Zarghoon site. A low amount of 0.12%DM was found in *A. brahuica*, in the winter season from Karkhasa and *B.baluchistanica*, it was an average 0.51%DM basis. High phosphorus was found during the spring season and it decreased in autumn and winter.*S. Mollis* had a high amount of phosphorus as it is a leguminous plant, almost a similar amount was reported from other leguminous plants by Nasrullah et al., [14]. The phosphorus content found from trees and shrubs during this study was more than those reported from grasses. 0.33% phosphorus in grasses in a temperate area and 0.22% in tropical areas, it was also found that phosphorus was highly affected by seasons [15-16]. More phosphorus was observed during spring and summer than in autumn and winter while working on different shrubs of arid environment they observed phosphorus contents in plant tissues declines with increasing maturity [17]. However mature trees and shrubs are found to be a good source of phosphorus for animal health during spring and summer season and these plants are also able to provide complete nutritional requirement to animals as all trees and shrubs examined were above the deficiency level of phosphorus which is below 0.15% [14-18]. Phosphorus is a mobile element, which may be strongly reused within the plant, is translocated from the senescent tissues to the younger ones [19-20].

2. Calcium

Shrubs evaluated for calcium concentration presented in table 1-6, ranged between 1.62-0.13% DM. Maximum amount 1.62% DM was found in *P. abrotanoides* in autumn season from Zarghoon site, followed by *P.eburnea* and *A.brahuica*0.65% DM, the medium amount was noted in *B. baluchistanica* 0.39% DM in the spring season and the low amount was found in *S. mollis* 0.13% DM in the spring season from Karkhasa**.** Significantly different ($P < 0.05$) was observed. The almost same amount was recorded from all shrubs except for *P. abrotanoides*, where the maximum amount of calcium was 1.62% DM, but this amount in the shrub is more than that required for animal nutrition, as a dietary level of 0.43% calcium is required [21, 22]. Accumulation in high concentrations of any element in any plant tissue without toxic effects may be a genetic characteristic and may include tolerance mechanism, although these elements are essential, they are also potentially toxic, so plant possesses complex biochemistry to control them [23]. Calcium recorded from shrubs was less than that found in trees, moreover, the low quantity from two shrubs *Atriplex lampa* and *Prosopis alpacto* in Northeastern Patagonia were also found [19, 24]. These findings were contrary to the already recorded higher calcium content (0.4-0.6%) from grasses and (1.2-1.6%) from legumes [14].

3. Sodium

The sodium concentration in shrub species ranged between 1.31-0.03% DM, this range was almost similar to that found in trees. The high concentration of sodium 1.31% DM was observed in *P. abrotanoides*, in the autumn season from Hazargangi. Medium amount (0.58%) DM was found in *P. eburnea* in the spring season from Zarghoon area .*A. brahuica*0.21% DM, in the spring season from Hazargangi, *C. ambigua*0.28% DM, and *S. mollis* 0.12% DM. In the spring season from Kaskhasa. Low sodium 0.03% DM was recorded from *B. baluchistanica* in the winter season. High sodium content was found during the winter season. Sodium in shrubs is nonsignificantly different ($P > 0.05$) from trees of the same area [25]. Similar results are found by [26] he found 0.22% sodium from tropical crops. While low sodium content was reported from grasses and legumes (0.09 and 0.06%) as reported by [14]. The standard concentration of Na in dry matter required for animal nutrition ranges between 0.09 and 0.21%, (CommonWealth Agricultural Bureau, 1980). The critical concentration of Na 0.06% in forage is recommended by NRC [27, 28]. The highest amount of sodium in *P. abrotanoides* makes it less palatable to the grazing animals, therefore, this plant is not liked by the animals and is not eaten by them so this shrub remains green and present throughout the year, and similar findings were observed by the [29], in *Atriplex sp*of Northeastern Patagonia.

4. Potassium

The amount of potassium in shrubs ranges from 1.14-0.04% DM. A high 1.14% DM amount was found in *P.abrotanoides* during the summer season from Hazargangi. Medium amount 0.64%DM was noted in *P. eburnean* and B.baluchistanica0.52% DM from Zarghoon during

the summer season, low amount 0.04% DM was recorded from *S. mollis* in the winter season from Karkhasa *C. ambigua* 0.26% DM and *A. brahuica* 0.23% DMwas found during summer season from Karkhasa. Similar amounts were recorded and it was found that the highest amount 0.78% DM of potassium in summer from the leaves of a shrub *Prosopis alpacto* [19]. Critical level for potassium is 0.60% as recommended by NRC [27]. Therefore, all samples analyzed had less than the required levels of potassium except two shrubs *P. eburnea and B. baluchistanica* had enough amount that can fulfill the animal requirements and are therefore recommended as the best plants of the area *P. abrotanoides* had an excessive amount of potassium in Zarghoon and Hazargangi which is more than the required amount recommended by NRC [27], is therefore not much suitable for animal consumption, although it may not produce any toxic effect. All other species were potassium deficient in all habitats these amounts were less than the required amount as recommended by NRC. Reduced potassium can also affect animal productivity by reducing appetite and food intake [30]. High solubility and diffusion are fundamental characteristics of hydrated potassium [K] ions. It provides them with functional mobility through a biological membrane and easy transportation over the entire plant, it also effects on opening and closing of stomata. Potassium also plays a vital role in the plant water economy because of its easy hydration and cooperation due to its abundance and high solubility [19].

5. Sulphur

Sulphur was studied seasonally in six dominant shrubs presented in table 1-6 and it was found in low levels in *A. brahuica, P. eburnea, C. ambigua, S. mollis,* and *B. baluchistanica,* it ranged between0.39- 0.30% DM during summer and autumn season from Zarghoon and Karkhasa. The lowest amount was found in *P. abrotanoides* 0.018% DM from Karkhasa in all four seasons. Sulphur is mainly assimilated by the plants.

6. Iron

Iron is found in plants as a microelement, the concentration of Iron of six dominated shrubs of Quetta valley were evaluated and presented seasonally **[Table 1-6].** The maximum amount was found in *C. ambigua* 0.64 % DM from autumn season from Karkhasa, medium amount 0.06% DM was found in *A. brahuica*, *P. eburnean* and *P. abrotanoides* were also recorded from three habitats. *B. baluchistanica* also showed a medium amount of 0.05% DM. The lowest amount of iron 0.01% DM was found in *S. mollis* from the autumn season from Hazargangi. Naturally occurring iron [Fe] content of fodder plants ranged from 18 to about 1000µg/g (0.018-0.10%), and various cereal grains do not differ much in their concentrations [31]. found the common average iron content of different cereal ranges from 25 to around 80µg/g. The iron deficiency causes chlorosis in leaves the excessive amount is beneficial and is stored in leaves. The amounts of iron recorded from all plants were equal or more than that required for animal nutrition therefore all plants studied to provide a good source of animal nutrition.

7. Zinc

Microelements was evaluated seasonally from three habitats and presented [**Table 1-6**]. Comparatively high percentages of zinc were obtained *P.abrotanoides*0.024% DM, the lowest amount was found in *A. brahuica* 0.003 %DM. Plant absorbed the maximum amount of zinc from Hazargangi habitat during spring and summer season. Zinc concentration found in the shrub study is lower than those recorded from wheat grains 16 mg/kg and mixed herbage 30 mg/kg [32]. Higher doses of phosphorus and zinc interacted negatively; therefore, the use of a balanced dose is necessary for better quality and productivity [33, 34].

On the other hand, in the Quetta region, the drought before these studies was one of the most important factors that also affect the shortage of moisture in the experimental area. Water availability involves the mobility of some elements such as zinc, which reduces the soil solution by decreasing soil moisture and the plant will be more encountered with deficiency of this element given the root growth restrictions [35, 36]. However when moisture is available then zinc reacts with sulphur and zinc sulfate plays a more important role in stomatal regulation and ion balance in plant systems to reduce the tensions of draught. It has also been reported the foliar application of zinc can increase the production of biomass [37]. Among the myriad of heavy metals zinc also occupies the prominent position, it plays a vital role in the growth and development of plants. Zinc is one of the essential nutrients of plants for normal growth and development [38].

8. Strontium

Strontium is found in plants as a micro-nutrient. The amount ranges in all plants were 0.006-0.001 %DM. Highest amount of strontium was found in *P. abrotanoides* 0.006 %DM in the summer season and from Karkhasa and the low amount was found in *A. Brahuica 0.002*%DM in all seasons from Zarghoon habitat. Strontium has been reported to act as a growth stimulant [39]. The strontium ion is similar to calcium ion, both chemically and physiologically. Strontium is metabolized similarly to calcium by animals and it can be a substituted for calcium in physiological processes.

9. Other Elements

Other microelement Aluminum [Al] and Manganese [Mn] of six shrubs were also evaluated from three habitats of Quetta. In Shrub the concentration of Aluminum [Al] in *A. brahuica* 0.003%DM was found, while in *C.ambigua, P.eburnea, and P. abrotanoides* 0.002% DM was observed, while 0.004% DM was found in *S. mollis*a nd in *B. baluchistanica* 0.003% DM was recordedfrom Zarghoon habitat. The concentration of manganese in *B. baluchistanica* was 0.006% DM. *P. abrotanoides* and *A.brahuica* 0.005% DM, while in *C.ambigua and S. mollis* 0.004% DM was recorded. *P. eburnea* showed 0.003% DM. However, the amount of these two elements was negligible in shrubs. Manganese is vital for the normal functioning of several enzymes and particularly for those that regulate the oxidation and reduction phenomena. This element is necessary for nitrate reduction and protein synthesis.

Seasons	Phosphorus%	Calcium%	Sodium%	Potassim%	Sulphur%	Iron%	Zinc%	Strontium%
HAZARGANGI								
Spring	0.37±0.02	0.51±0.06	0.21±0.02	0.14±0.02	0.24±0.03	0.02±0.002	0.002± 0.001	0.001
Summer	0.38±0.02	0.52±0.08	0.20±0.03	0.13±0.02	0.28±0.03	0.01±0.002	0.002± 0.001	0.002
Autumn	0.47±0.02	0.47±0.05	0.24±0.02	0.16±0.03	0.26±0.02	0.02±0.002	0.003± 0.002	0.001
Winter	0.32±0.02	0.41±0.04	0.21±0.03	0.11±0.01	0.32±0.03	0.03±0.002	0.002± 0.001	0.001
Mean	**0.39**	**0.48**	**0.22**	**0.14**	**0.29**	**0.02**	**0.002**	**0.001**
ZARGHOON								
Spring	1.25±0.02	0.53±0.3	0.18±0.03	0.20±0.02	0.35±0.02	0.05±0.002	0.002± 0.001	0.001
Summer	1.02±0.3	0.56±0.4	0.17±0.03	0.19±0.02	0.39±0.04	0.03±0.003	0.003± 0.002	0.002
Autumn	1.39±0.2	0.65±0.3	0.17±0.03	0.12±0.02	0.39±0.03	0.04±0.002	0.002± 0.001	0.002
Winter	1.41±0.2	0.49±0.2	0.16±0.02	0.12±0.02	0.37±0.03	0.051±0.002	0.002± 0.001	0.002
Mean	**1.27**	**0.56**	**0.17**	**0.15**	**0.37**	**0.043**	**0.002**	**0.002**
KARKHASA								
Spring	0.18±0.02	0.61±0.03	0.20±0.12	0.22±0.02	0.38±0.03	0.07±002	0.002± 0.001	0.002
Summer	0.17±0.02	0.52±0.05	0.27±0.12	0.32±0.12	0.42±0.02	0.05±0.003	0.002± 0.001	0.001
Autumn	0.16±0.02	0.57±0.06	0.57±0.11	0.34±0.12	0.39±0.03	0.06±0.002	0.003± 0.002	0.001
Winter	0.12±0.02	0.49±0.02	0.28±0.11	0.23±0.12	0.37±0.02	0.05±0.002	0.002± 0.001	0.001`
Mean	**0.16**	**0.55**	**0.25**	**0.27**	**0.39**	**0.06**	**0.002**	**0.001**

*Each value is mean ± standard deviation of twelve determinations.

Mn [0.001% – 0.005%], Al [0.001% – 0.003%] ANOVA [$P < 0.05$], [$P > 0.05$]

Table 1. The concentration of foliage elements of *A. brahuica*

Seasons	Phosphorus %	Calcium%	Sodium%	Potassium%	Sulphur%	Iron%	Zinc%	Strontium%
HAZARGANGI								
Spring	1.65 ± 0.2	0.46 ± 0.02	0.32 ± 0.10	0.26 ± 0.02	0.20±0.02	0.02 ± 0.002	0.05± 0.002	0.003
Summer	1.70 ± 0.2	0.48 ± 0.04	0.31 ± 0.03	0.61 ± 0.02	0.25±0.03	0.03 ± 0.002	0.04± 0.002	0.002
Autumn	1.67 ± 1.02	0.52 ± 0.02	0.18 ± 0.02	0.63 ± 0.02	0.27±0.03	0.02 ± 0.002	0.02± 0.002	0.003
Winter	1.46 ± 0.02	0.32 ± 0.02	0.19 ± 0.03	0.42 ± 0.02	0.23±0.02	0.05 ± 0.002	0.02± 0.002	0.003
Mean	**1.62**	**0.45**	**0.25**	**0.48**	**0.23**	**0.03**	**0.03**	0.003
ZARGHOON								
Spring	1.62 ± 0.02	0.61 ± 0.03	0.58 ± 0.03	0.66 ± 0.02	0.24±0.02	0.05 ± 0.002	0.04± 0.002	0.003
Summer	0.53 ± 0.02	0.63 ± 0.04	0.47 ± 0.03	0.64 ± 0.01	0.27±0.02	0.08 ± 0.003	0.06± 0.002	0.002
Autumn	1.40 ± 1.02	0.65 ±0.03	0.36 ± 0.02	0.63 ± 0.02	0.31±0.03	0.05 ± 0.002	0.04± 0.002	0.002
Winter	0.39 ± 0.02	0.49 ±0.02	0.39 ± 0.02	0.64 ± 0.02	0.26±0.02	0.03 ± 0.002	0.05± 0.002	0.002
Mean	**0.98**	**0.59**	**0.45**	**0.64**	**0.27**	**0.65**	**0.04**	**0.002**
KARKHASA								
Spring	1.18 ± 0.02	0.41 ± 0.03	0.29 ± 0.02	0.35 ± 0.02	0.28±0.03	0.06 ± 0.002	0.04± 0.002	0.003
Summer	1.19 ± 0.02	0.52 ± 0.04	0.27 ± 0.02	0.36 ± 0.02	0.34±0.02	0.06 ± 0.003	0.04± 0.002	0.003

Autumn	1.10 ± 0.02	0.49 ± 0.03	0.26 ± 0.02	0.46 ± 0.02	0.34±0.02	0.04 ± 0.002	0.03± 0.002	0.002
Winter	1.12 ± 0.02	0.47 ± 0.02	0.18 ± 0.02	0.41 ± 0.02	0.19±0.03	0.05 ± 0.002	0.03± 0.002	0.004
Mean	**1.14**	**0.47**	**0.25**	**0.39**	**0.28**	**0.05**	**0.03**	**0.003**

*Each value is mean ± standard deviation of twelve determinations.

Mn [0.001% – 0.003%], Al [0.001% – 0.002%] ANOVA [P < 0.05], [P > 0.05]

Table 2. Concentration of foliage elements of *P. eburnean*

Seasons	Phosphorus%	Calcium%	Sodium%	Potassium%	Sulphur%	Iron%	Zinc%	Strontium%
HAZARGANGI								
Spring	0.50 ± 0.02	0.39± 0.03	0.25± 0.02	0.26 ± 0.02	0.27± 0.002	0.02± 0.001	0.02± 0.001	0.003
Summer	0.49 ± 0.3	0.30± 0.04	0.31± 0.03	0.32 ± 0.02	0.32± 0.002	0.01± 0.001	0.03± 0.002	0.003
Autumn	0.86 ± 0.02	0.39± 0.02	0.28± 0.02	0.48 ±0.02	0.29± 0.002	0.01± 0.001	0.03± 0.001	0.002
Winter	0.59 ± 0.02	0.31± 0.02	0.42± 0.02	0.42 ± 0.02	0.26± 0.002	0.02± 0.001	0.02± 0.001	0.002
Mean	**0.55**	**0.34**	**0.31**	**0.37**	**0.28**	**0.01**	**0.02**	**0.002**
ZARGHOON								
Spring	1.02 ± 0.2	0.61± 0.03	0.28± 0.03	0.24± 0.02	0.30± 0.002	0.05± 0.002	0.03± 0.001	0.002
Summer	1.40 ± 0.3	0.71± 0.04	0.27± 0.02	0.25± 0.01	0.31± 0.002	0.03± 0.003	0.04± 0.002	0.002
Autumn	1.2 ± 0.2	0.65± 0.06	0.23± 0.02	0.22 ± 0.02	0.33± 0.002	0.05± 0.002	0.03± 0.001	0.003
Winter	1.5 ± 0.2	0.48± 0.02	0.30± 0.02	0.24 ± 0.02	0.28± 0.002	0.05± 0.002	0.02± 0.001	0.002
Mean	**1.28**	**0.61**	**0.27**	**0.23**	**0.30**	**0.24**	**0.03**	**0.002**
KARKHASA								
Spring	0.8 ± 0.02	0.16± 0.03	0.26 ±0.02	0.25 ± 0.02	0.28± 0.002	0.07± 0.002	0.05± 0.002	0.002
Summer	0.7 ± 0.02	0.15± 0.05	0.27± 0.03	0.26 ± 0.02	0.29± 0.002	0.09± 0.003	0.04± 0.001	0.003
Autumn	0.8 ± 0.02	0.16± 0.06	0.26± 0.2	0.24 ± 0.02	0.33± 0.002	0.64± 0.002	0.02± 0.001	0.003
Winter	0.7 ± 0.02	0.14± 0.02	0.28± 0.3	0.24 ± 0.02	0.25± 0.002	0.52± 0.002	0.02± 0.001	0.002
Mean	**0.75**	**0.15**	**0.26**	**0.24**	**0.28**	**0.20**	**0.03**	**0.002**

*Each value is mean ± standard deviation of twelve determinations.

Mn [0.001% – 0.004%], Al [0.001% – 0.002%] ANOVA [P < 0.05], [P > 0..05]

Table 3. Concentration of foliage elements of *C. ambigua*

Seasons	Phosphorus%	Calcium %	Sodium%	Potassium%	Sulphur%	Iron%	Zinc%	Strontium%
HAZARGANG								
Spring	0.96 ±0.2	0.9±0.1	0.32±0.01	0.15±0.02	0.22±0.02	0.02±0.01	0.06±0.02	0.002
Summer	1.2 ±0.2	0.37±0.1	0.31±0.02	0.13±0.02	0.26±0.03	0.02±0.02	0.07±0.02	0.002
Autumn	1.0 ±0.3	0.55±0.1	0.25±0.03	0.14±0.03	0.26±0.02	0.01±0.03	0.04±0.01	0.002
Winter	0.9 ±0.1	0.31±0.2	0.23±0.02	0.11±0.02	0.25±0.02	0.02±0.02	0.04±0.01	0.002
Mean	**1.02**	**0.40**	**0.27**	**0.13**	**0.24**	**0.01**	**0.05**	**0.002**
KARKHASA								
Spring	0.8±0.3	0.13±0.3	0.12±0.03	0.06±0.01	0.27±0.1	0.02±0.01	0.04±0.02	0.002

Summer	1.3±0.4	0.15±0.2	0.13±0.01	0.06±0.02	0.28±0.2	0.02±0.01	0.05±0.01	0.003
Autumn	0.6±0.2	0.17±0.2	0.12±0.01	0.05±0.01	0.27±0.2	0.01±0.02	0.03±0.01	0.002
Winter	0.6±0.2	0.15±0.2	0.13±0.02	0.04±0.02	0.32±0.2	0.02±0.02	0.03±0.02	0.002
Mean	**0.82**	**0.15**	**0.13**	**0.05**	**0.28**	**0.06**	**0.04**	**0.002**

*Each value is mean ± standard deviation of twelve determinations.

Mn [0.001% – 0.004%] Al [0.001% – 0.004%] ANOVA [P < 0.05], [P > 0.05]

Table 4. Concentration of foliage elements of S. *mollis*

Seasons	**Phosphorus%**	**Calcium%**	**Sodium%**	**Potassium%**	**Sulphur%**	**Iron%**	**Zinc%**	**Strontium%**
HAZARGANGI								
Spring	1.00 ± 0.1	1.10±0.3	1.3 ±0.3	1.12± 0.02	0.24±0.01	0.031 ± 0.01	0.02±0.01	0.004
Summer	0.9 ± 0.1	1.23±0.4	1.23± 0.04	1.14± 0.02	0.28±0.02	0.02± 0.001	0.02±0.01	0.004
Autumn	0.82 ± 0.1	1.5±0.2	1.31± 0.03	1.13± 0.03	0.27±0.01	0.02 ± 0.002	0.02±0.01	0.005
Winter	0.62 ± 0.2	1.05±0.2	1.25± 0.4	1.12± 0.02	0.0.27±0.02	0.02± 0.001	0.02±0.01	0.004
Mean	**0.83**	**1.22**	**1.27**	**1.12**	**0.26**	**0.02**	**0.02**	**0.004**
ZARGHOON								
Spring	0.55 ± 0.3	0.50± 0.10	0.3± 0.01	0.18± 0.02	0.20±0.01	0.05± 0.002	0.024±0.02	0.003
Summer	1.55 ± 0.3	1.61± 0.3	0.20± 0.02	0.13± 0.02	0.24±0.01	0.04± 0.001	0.023±0.02	0.004
Autumn	1.04 ± 0.1	1.62± 0.5	0.22± 0.01	0.13± 0.03	0.26±0.02	0.03 ± 0.01	0.012±0.01	0.004
Winter	1.07 ± 0.2	0.48± 0.4	0.2± 0.02	0.16± 0.02	0.23±0.02	0.04 ± 0.001	0.010±0.01	0.003
Mean	**1.05**	**1.05**	**0.23**	**0.5**	**0.23**	**0.04**	**0.17**	**0.003**
KARKHASA								
Spring	0.28 ± 0.02	1.20 ± 0.03	0.30 ± 0.02	0.19 ± 0.02	0.018±0.01	0.06 ± 0.002	0.023±0.01	0.003
Summer	0.26 ± 0.02	1.30 ± 0.01	0.33 ± 0.02	0.15 ± 0.02	0.019±0.01	0.04 ± 0.002	0.026±0.02	0.006
Autumn	0.26 ± 0.03	1.29± 0.01	0.31 ± 0.2	0.15 ± 0.02	0.021±0.02	0.05 ± 0.001	0.027±0.02	0.004
Winter	0.23 ± 0.04	1.38 ± 0.02	0.32 ± 0.2	0.13 ± 0.02	0.020±0.02	0.042±0.001	0.020±0.02	0.005
Mean	**0.25**	**1.29**	**0.31**	**0.15**	**0.020**	**0.04**	**0.024**	**0.004**

*Each value is mean ± standard deviation of twelve determinations.
Mn [0.001% – 0.005%], Al [0.001% – 0.002%] ANOVA [P < 0.05], [P > 0.05]

Table 5. Concentration of foliage elements of *P. abrotanoides*

sons	**sphorus%**	**cium%**	**ium%**	**assium%**	**phur%**	**n%**	**c%**	**ontium%**
RGHOON								
ing	3±0.1	9±0.2	4±0.003	2±0.03	5±0.02	4±0.002	3±0.01	02
nmer	6±0.16	7±0.1	4±0.003	2±0.02	7±0.02	5±0.003	5±0.01	03
umn	0±0.2	4±0.1	4±0.002	7±0.01	0±0.03	5±0.001	5±0.02	03
nter	2±0.2	2±0.1	3±0.002	7±0.2	3±0.02	4±0.002	4±0.01	03
an	**1**	**5**	**3**	**7**	**7**	**4**	**4**	**03**

*Each value is mean ± standard deviation of twelve determinations.
Mn [0.001% – 0.006%], Al [0.001% – 0.003%] ANOVA [P < 0.05], [P > 0.05]

Table 6. Concentration of foliage elements of B. *baluchistanica*

Conclusion

In summary, all macro and micro elements such as P, Ca, Na, K, S, Fe, Zn, Sr, Al and Mn are useful tool to rank the forage according to their nutritive quality. All subjected shurbs *Amylgdalus brahuica* Boiss, *Prunus eburnea Aitch*, *Caragana ambigua* Stocks, *Sophora mollis* Royle, *Perovskia abrotanoides* Karel, and *Berberis baluchistanica* Ahrendt shows that these could have greater nutritional value. Maximum shrub consider to be palatable and preferred by the small ruminants. While A.brahuica and C.cambigua medium amount of minerals for animal food. P.abrotanoidesmy and S.mollis use as fooder in very less amount for animals due to very sharp smell and presences of different chemical composition on leaves. Theses composition should be vary according to seasonal changes and area wise Quetta belongs to arid and semi-arid where prolong drought condition effect on forage chemical composition. However microelement such as Al and Mn value negligible in maximum shrub.

References

1. Shaheen, G., Zaidi, M. A., & Mansoor, A. (2008). Forage evaluation of Berberis baluchistanica used as fodder. *Int J Biol and Biot*, 5; 149-154.
2. Corbet, H. A. (1951). Fodder Trees; suggestions for their wider use. The imperial printing company, Perth.
3. Imperial Agricultural Bureaux. (1947). The use and misuse of shrubs and trees as fodder. JointPubl 10, *Imperial AgrBureaux.*, berystwyth.
4. Fao. (1989). *The state of food and agriculture* (Vol. 37). Food & Agriculture Organization of the UN (FAO).
5. Hussain, F., & Durrani, M. J. (2009). Nutritional evaluation of some forage plants from Harboi Rangeland, Kalat, Pakistan. *Pak. J. Bot*, *41*; 1137-1154.
6. Rosendo, O., McDowell, L. R., Staples, C., Shearer, J. K., Wilkinson, N. S., & Seymour, W. M. (2010). Relacion Del higado graso leve y el estatus de (beta)-caroteno, vitaminas A y E en vacas Holstein durante el periparto. *Revista Científica de la Facultad de Ciencias Veterinarias*, *20*; 399-409.
7. Uchida, R. (2000). Essential nutrients for plant growth: nutrient functions and deficiency symptoms. *Plant nutrient management in Hawaii's soils*, 31-55.
8. Siddiqui, M.F., Ahmed, M., Shaukat, S. S. and Ajaib, M. (2011). Soil and foliar nutrients concentration of conifer species in the communities of moist temperate areas of southern Himalayan and Hindukush region of Pakistan. *fuuast J. Biol*,1; 91-101.
9. Siddiqui, M. F. Shaukat, S. S. and Ahmed, M. (2014a). Topographic and edaphic control of arboreal vegetation and the distribution and growth of tree species in moist temperate areas of Himalayan and Hindukush region of Pakistan. *Pak. J. Bot*. 46; 1187-1196.
10. Siddiqui, M. F., Shaukat, S. S., Ahmed, M., Khan, I. A. and Khan, N. (2014b). Foliar and soil nutrient distribution in conifer dominated forests of moist temperate areas of Himalayan and Hindukush region of Pakistan: a multivariate approach. *Pak. J. Bot*. 46; 1811-1827.
11. Shrivastava, P., & Kumar, R. (2015). Soil salinity: a serious environmental issue and plant growth promoting bacteria as one of the tools for its alleviation. *Saudi J. Biol. Sci*, *22*; 123-131.
12. Khan, Z. I., M. Ashraf, A., K. Ahmed., I. Mustasfa and M. Danidsh. (2007). Evaluation of micro minerals composition of different grasses in relation to livestock rerquirements. *Pak.J. Bot*., 39; 719-728.
13. A Manual of Experiments for Plant Biology. (1995). Edited by Kokichi Hinata 13 Teruyoshi Hashiba. *Soft Science Publications, Tokyo.Japan*, 275-279.
14. Nasrullah, Niimi, M., R. Akashi, and O.Kawamura. (2004). Nutritive evaluation of forage plants grown in South Sulawesi, Indonesia II. Mineral Composition. Asian-Aust. *J. Anim. Sci*, 17; 63-67.
15. Fabre, A., Gauquelin, T., Vilasante, F., Ortega, A., & Puig, H. (2006). Phosphorus content in five representative landscape units of the Lomas de Arequipa (Atacama Desert- Peru). *Catena*, *65*; 80-86.
16. Norton, B.W. (1981). Differences between species in forage quality. *In*: Hacker, J. B. (Ed.).Nutritional limits to animals production from pastures. Proceedings of an International symposium held at St Lucida, Queen's land. Australia, 89-110.
17. Badri, M. A. and A. I. Hamed. (2000). The nutrient value of plants in an extremely arid environment (WadiAllaqi Biosphere Reserve, Egypt). *Journal of Arid Environments*, 44; 347-356.
18. Allen, S.E. (1989). Chemical Analysis of Ecological Materials. Oxford: *Blackwell Scientific Publication*, 368pp.
19. Del Valle, H. F., and R. A. Rosell. (2000). Mineral composition of perennial vegetation of shrub patches in Northeastern Patagonia. *Arid. Soil Res. Reh*, 14; 15-25.
20. Młodzińska, E., & Zboińska, M. (2016). Phosphate uptake and allocation–a closer look at *Arabidopsis thaliana* L. and *Oryza sativa* L, *Fronti. Plant Sci*, *7*; 1198.
21. Little, D, A. (1982). Utilization of minerals. In Hacker, J.B. [Ed.], Nutritional limits to animal production from Pastures, 259-283pp. Farnham Royal, Uk: *Common Wealth Agricultural Bureau*.
22. Chriyaa, A. (2009). The use of shrubs in livestock feeding in low rainfall areas. *L.L.S.S*, 73.
23. Özcan, T., and G. Bayçu. (2005). some elemental concentrations in the acorns of Turkish QuercusL. (Fagaceae) taxa. *Pak.J. Bot*, 37; 361-371.
24. White, P. J., & Broadley, M. R. (2003). Calcium in plants. *Ann. Bot*, *92*; 487-511.
25. Shaheen, G. (2005). Seasonal variation in nutritional and anti-nutritional components of native trees and shrubs grown in HazarganjiChiltan National Park, Zarghoon and Karchasa. Ph. D thesis submitted to Balochistan University.
26. Minson, D.J. (1990). Forage in ruminant nutrition. Division of tropical crops and pastures.Common Wealth scientific and industrial research organization. St. LUCI, Queensland, Australia. P. 51.
27. NRC (1996). Nutrient Requirement of Beef cattle (7th Rev. Edt.). National Research Council, Washington, DC; *National Academy Press.*
28. Anonymous (1996). Nutrient Requirements of Domestic Animals (No. 4). Nutrient Requirements of Beef Cattle. 6th rev. ed. National Research Council (NRC). *National Academy of Science Press.*, Washington, DC.
29. Silva. Colomer, J. H., and C. B. Passera (1990). The nutritional value of *Atriplex spp*. As fodder for arid regions. *Journal of Arid Environments*, 19; 289-295.
30. Huston, J. E. and Pinchak, W.E. (1993). Range animal nutrition: *In*: Grazing management. An Ecological perspective. *Timber press Portland.*, Oregon.
31. Kabata-Pendias,A. and, H. Pendias (1986). Trace elements in Soil and Plants. *CRC Press, Inc. BocaRaton, Florida.*
32. Reuter, D. J., and J. B. Robinson. (1986). Plant analysis Intake *Press Melbourne.*, Sydney.369-390pp.
33. Deepak Kumar. (2015). Phosphorus and zinc fertilization in fodder cowpea, *A review Agri. Review*, 36; 333-338.

34. Kajan Kumar and AditiSoni (2014). Elemental Ratio and Their Importance in Feed and Fodder *Int. J. Pure App. Biosci*. 2; 154-160.
35. Sepiedeh, Z., Mohammad N, Hamid R, Tohidi M, and Hossein Z. (2014). Effect of zinc and sulfur foliar applications on physiological characteristics of sunflower (Helianthus annuus L.) under water deficit stress. *International Journal of Biosci*, 5; 87-96.
36. Kafi M & Rostami M. (2007). Yield characteristics and oil content of three safflower (*Carthmus tinctorius* L.) cultivars under drought in reproductive stage and irrigation with saline water. *J. Agric Res*, 5; 121-131.
37. Kaya C & Higgs D. (2002). Response of tomato (*Lycopersicon esculentum* L.) cultivars to foliar application of zinc when grown in sand culture at low zinc, *Sci. Hortic*. 93; 53-64.
38. Vijayarengan.P & G.Mahalakshmi. (2013). Zinc Toxicity in Tomato Plants, *World. Appl. Sci J*. 24; 649-653.Under Wood. E. J. (1977). Trace elements in Human and Animal Nutrition. 4thed. *Academic Press.Newyork*.